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(54) Mobile station positioning system

(57) A mobile station (21) receives signals from at least two base stations (22,23,24) and determines time differences of the clocks of the received signals. The mobile station (21) sends information about the time differences to a positioning service center (26) of the mobile communication system which calculates the position of the mobile station (21) on the basis of the time difference information and base station coordinates and clock information. With the method it is possible to measure signals the strengths of which remain below the minimum decoding level. According to the invention, it is also possible to measure bursts containing short training sequences to improve timing measurement accuracy and measuring speed. The time difference measurement results obtained are transmitted from the mobile station to a base station advantageously by encoding the results in a signalling channel (SACCH) burst. The method enables quick position measuring at short intervals without substantially increasing the load on the mobile station or on the air interface.

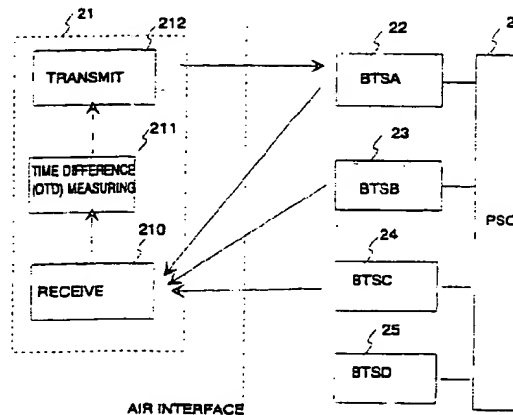


FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 96 66 0060

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	WO 95 00821 A (OMNIPLEX INC) 5 January 1995 * page 9, line 4 - page 10, line 19 *	1-3,6,7,11	H0407/38 G01S5/00
Y	* page 14, line 36 - page 19, line 10 *	10	
Y	WO 93 07690 A (MOTOROLA INC) 15 April 1993 * page 3, line 18 - page 5, line 10 * * page 6, line 1 - line 15 * * page 8, line 17 - page 9, line 31 * * page 11, line 8 - page 12, line 29 * * page 13, line 33 - page 14, line 9 *	10	
X	US 5 423 067 A (MANABE SHINICHI) 6 June 1995 * column 4, line 3 - column 5, line 52 *	1,5-8,11	
X	US 5 293 645 A (SOOD PREM L) 8 March 1994 * column 4, line 7 - column 6, line 43 *	1,6,7,11	
X	MOULY M ET AL: "THE PSEUDO-SYNCHRONISATION, A COSTLESS FEATURE TO OBTAIN THE GAINS OF A SYNCHRONISED CELLULAR NETWORK" MRC MOBILE RADIO CONFERENCE, 13 November 1991, pages 51-55, XP000618384 * page 54, left-hand column, line 1 - right-hand column, line 22 *	1,6,7,11	<div>TECHNICAL FIELDS SEARCHED (Int.Cl.6)</div> <div>H04Q G01S</div>
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 5 March 1999	Examiner Baas, G
<div>CATEGORY OF CITED DOCUMENTS</div> <div> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document </div>		<div> T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons S : member of the same patent family, corresponding document </div>	

EPO FORM 1503 03/82 (P04/031)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 96 66 0060

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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05-03-1999

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
WO 9500821	A	05-01-1995	AU	7173694 A	17-01-1995
			US	5815538 A	29-09-1998
WO 9307690	A	15-04-1993	US	5241545 A	31-08-1993
			CA	2097058 A,C	31-03-1993
			GB	2265800 A,B	06-10-1993
			JP	6503462 T	14-04-1994
			MX	9205517 A	01-03-1993
US 5423067	A	06-06-1995	JP	5067996 A	19-03-1993
			GB	2260050 A,B	31-03-1993
US 5293645	A	08-03-1994	JP	5211470 A	20-08-1993

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